

Self-Bearing Motor-Generator for Flywheels, Phase I

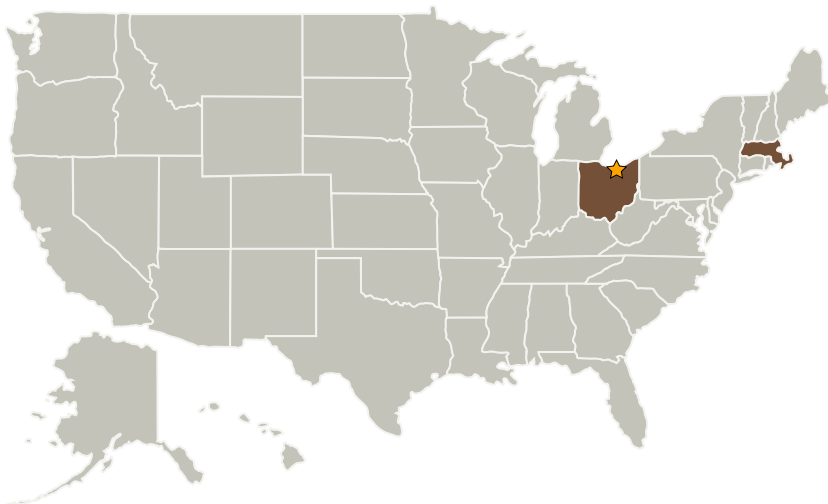
Completed Technology Project (2004 - 2004)



Project Introduction

Self-bearing or ?bearingless? motors perform both motor and bearing support functions but such devices have not yet achieved speeds above 15,000 rpm. The innovation proposed for a self-bearing motor-generator (M-G) will achieve speeds above 30,000 rpm, moving the technology to a new frontier, not only for the motor but the generator functions as well. As applied to a flywheel energy storage system (FESS), the concept replaces the permanent-magnet bearings, conventional M-G, as well as the need for the active damper. The self-bearing function is implemented with a proportional integral derivative control and has adjustable damping as in conventional active magnetic bearings. As a result, the flywheel end rotors are shortened substantially and could enable running at much higher speed without concerns regarding the first bending critical speed. Further, elimination of rotor parts will enhance the reliability of the mechanical system. Although a self-bearing approach could result in a less efficient magnetic bearing combined with a less efficient motor, the proposed approach will solve the efficiency problem, making it ideal for the high energy efficiencies required for FESS. With such improved efficiencies and reliability, the self-bearing M-G will serve as a modular building-block technology for the power management and distribution systems used in observation platforms for earth science missions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Foster-Miller Inc	Supporting Organization	Industry	Waltham, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Hsiang Ming Chen

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.5 Electrical Machines